GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER-II

MECHATRONICS ENGINEERING

Subject Name: **Fundamentals and Applications of Nanotechnology (Elective – III)**

Subject Code: **1724708**

Sr. No.	Content	Hours
1	Introduction to nanotechnology Need of nanotechnology; Applications in various fields; Size effect in micro and nanomachining	4
2	Introduction to carbon nanotubes Basics of carbon nanotubes; methods of manufacturing; properties of carbon nanotubes; Applications of carbon nanotubes	5
3	Micro and Nano fabrication Basic microfabrication techniques (lithography, thin film deposition and doping, etching and substrate removal, substrate bonding); MEMS fabrication techniques (bulk micromachining, surface micromachining, high-aspect ratio micromachining); Nanofabrication techniques(E-beam and nano-imprint fabrication, scanned probe techniques, strain engineering, self-assembly)	8
4	Nano Surface Finishing Techniques Stamping technique for micro and nano fabrication (methods and applications); Laser machining; Electron beam and ion beam machining; Abrasive based surface finishing methods	7
5	MEMS / NEMS devices and applications Pressure sensor (capacitive sensors, accelerometer, gyroscope, micro mirror switching matrix, contact switches); inertial sensor; optical MEMS; RF MEMS; NEMS devices and applications	5
6	Scanning Probes Principle of operation; instrumentation; scanning tunnelling microscope; atomic probe microscope; types of probes	7
7	Nano Positioning Systems Various guiding systems for moving elements	4
	Total number of hours	**40**

Text Book:

1. Handbook of Nanotechnology
   Bhushan (Editor), Springer publication

Reference Books:

1. Nanotechnology
   Norio Taniguchi, Oxford University Press
2. Micro and nanomanufacturing (size effect is explained in chapter 4)
   Mark J. Jackson, Springer Publication
3. Nano: The essentials
   T. Pradeep, TATA-McGraw-Hill Publishing Co. Ltd.